January a month of two halves for UK weather

Description

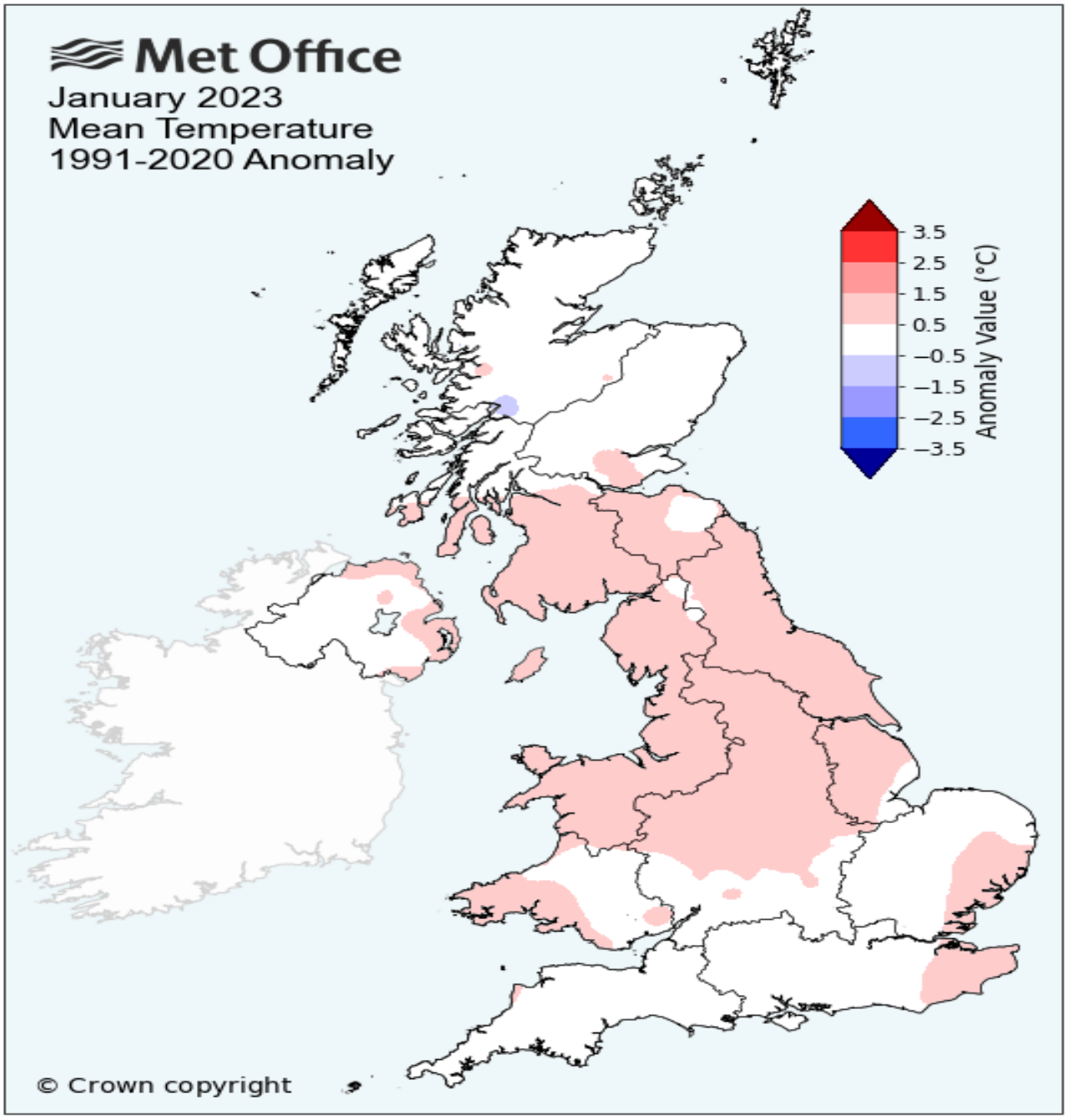
2023 has started with a January of marked contrasts, which has resulted in overall near-average figures for many of the UK’s weather statistics.

According to provisional Met Office figures, the one relatively consistent visitor was sunshine with England having its second sunniest January on record in a series which goes back to 1919. England had an average of 77.6 hours of sunshine, failing to top the record breaking 80.7 hours seen in January 2022.

The UK also had its third sunniest January on record, with an average of 63.1 hours of sunshine.

Contrasting temperatures

The month’s temperature figures were marginally warmer than average, with a period of mild weather at the start of the month followed by a cold spell. Later in the month, temperatures returned nearer to average, albeit with the north of the UK seeing the highest temperatures in the month.



January 2023 mean temperature

Dyce, in Aberdeenshire, had January 2023's highest temperature with 15.8°C on 24 January, though partly thanks to the Foehn effect, it's not uncommon for Scotland to see the highest temperature recorded in a winter month.

Drumnadrochit, Inverness-shire, posted the lowest daily minimum temperature of the month, with –10.4°C the lowest temperatures got in January.

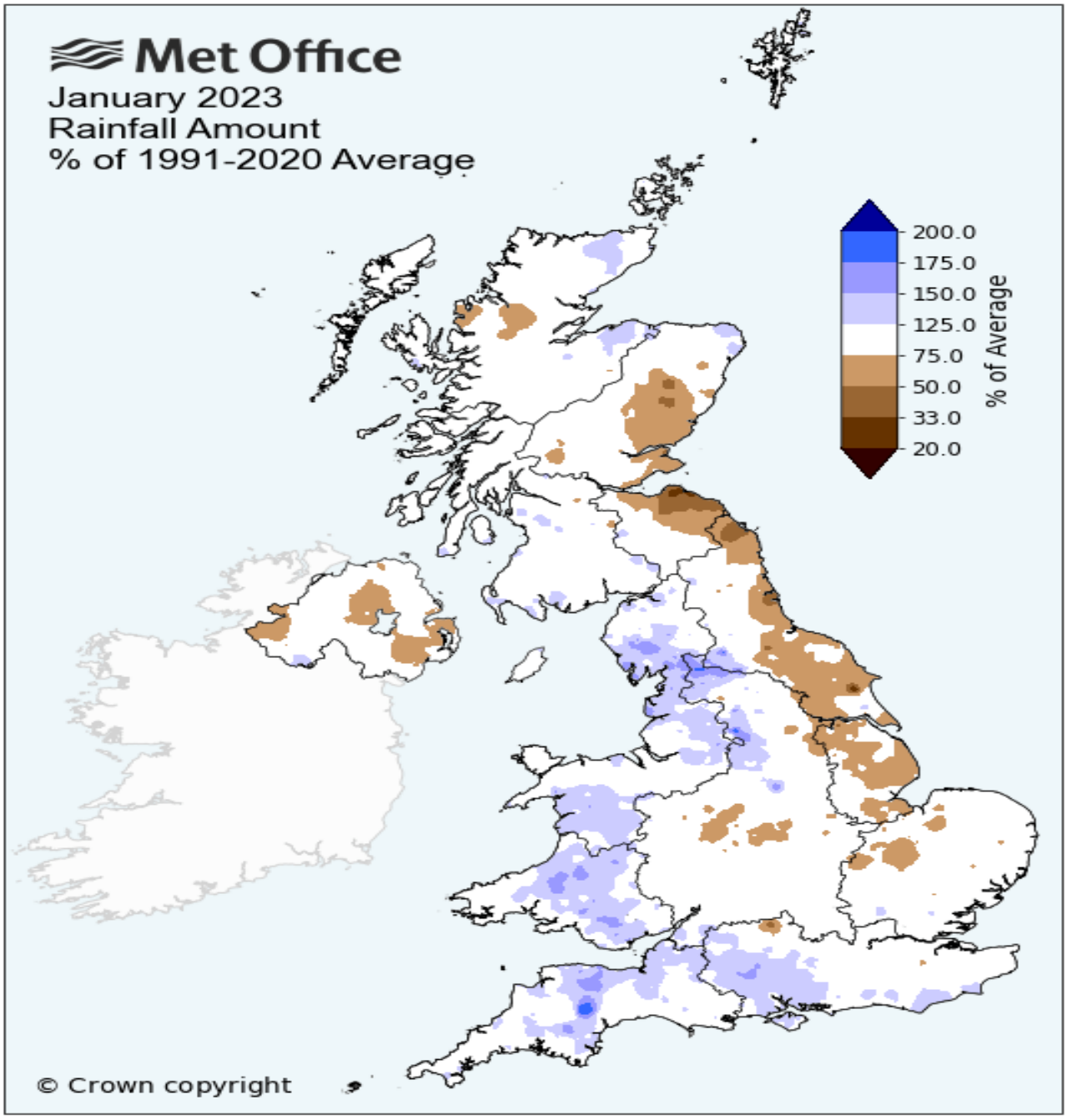
These contrasts helped to bring the UK mean temperature for January to 4.4°C, just 0.4°C above average.

The National Climate Information Centre Manager Dr Mark McCarthy said: “After a record-breaking 2022 for heat in the UK, January has started this year with a near-average month for temperature, which masks a period of cold weather in the middle of the month, as well as some mild weather at the start of the year.

“The month’s weather has largely been flipping from westerlies with milder air and rain to influxes of northerly air with cold and dry weather, which is not unusual for a UK winter. What this results in is fairly typical January temperature and rainfall statistics when averaged across the whole month.”

Fluctuating rainfall

Similarly to the temperature figures, January 2023 saw near average rainfall for the UK with 125.7mm falling, 3% more than average.



January 2023 rainfall amount

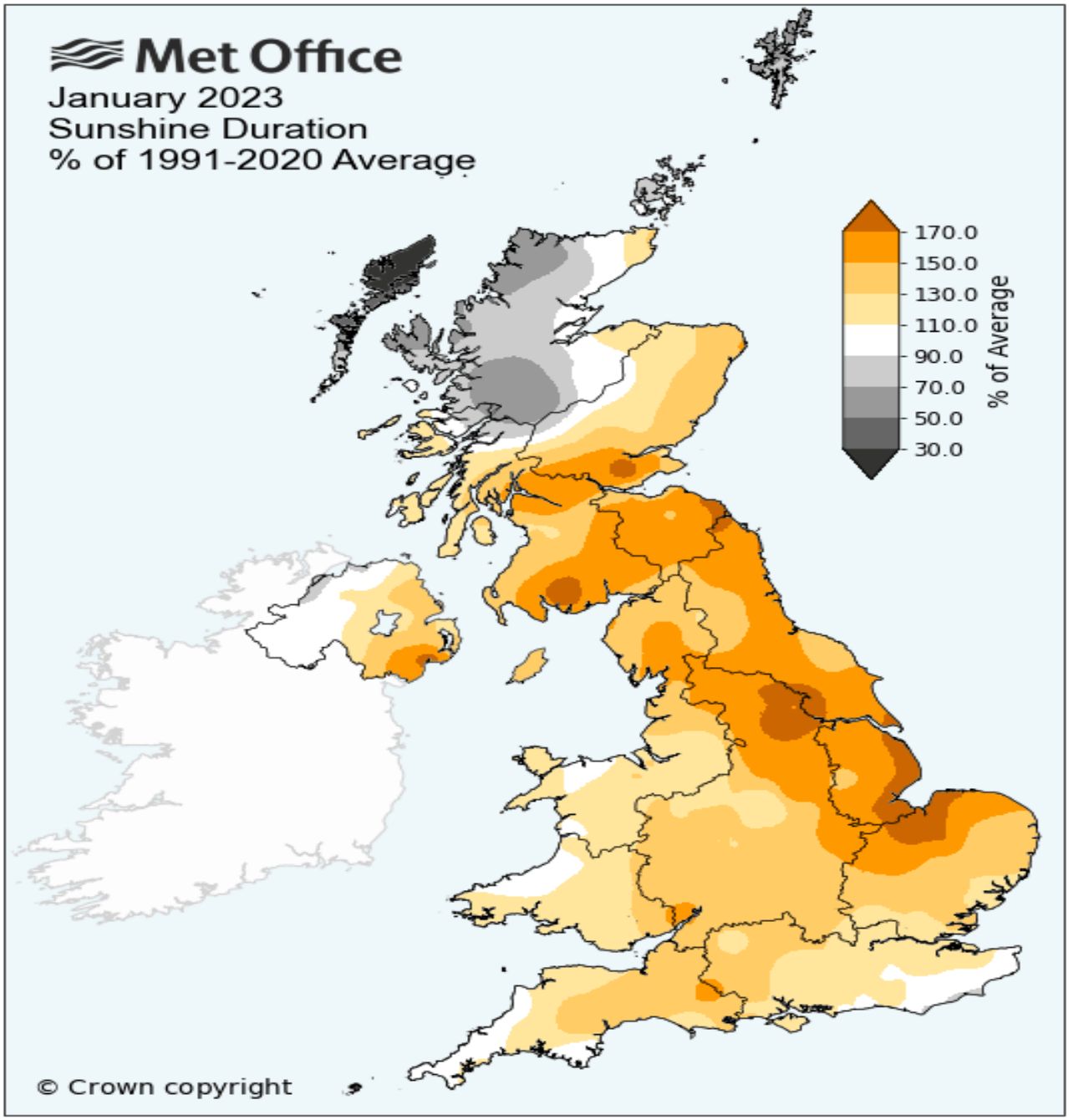
Rain in January generally coincided with the mild air and a dominant westerly regime early in January.

Wales has seen 25% more rain than average, with 194.7mm falling in the month and England 9% more than average with 90.5mm.

Northern Ireland and Scotland both saw less rainfall than average, with 95.2mm (83% of average) and 171.5mm (96% of average) respectively.

Sun shines for January

January sunshine was in good supply, though not enough to trouble 2022's record January sunshine figures for England.



January 2023 sunshine duration

The UK had its third sunniest January on record in a series which dates back to 1919, though much of the UK experienced a sunnier than average month.

Western and northern areas of Scotland got the least in the way of sunshine, with the Western Isles, a location not prone to January sunshine, having a fairly dull month, though not record-breaking.

In contrast, Berwickshire was one of a number of counties to see record levels of January sunshine, with many seeing more than 50% more sunshine hours than their averages for the month.

Dr Mark McCarthy continued: “One notable feature of January’s weather was the sunshine, with plenty of clear spells of weather, though not enough to trouble any national records.

“The far northwest might feel a little short-changed with sunshine duration, as well as western areas of Northern Ireland thanks to some more persistent cloud and rain moving in off the Atlantic in January.”

Provisional January 2023	Mean temp (°C)		Sunshine (hours)		Rainfall (mm)	
	Actual	Diff from avg (°C)	Actual	% of avg	Actual	% of avg
UK	4.4	0.4	63.1	133	125.2	103
England	4.9	0.5	77.6	140	90.5	109
Wales	5.0	0.6	55.7	118	194.7	125
Scotland	3.2	0.3	42.9	122	171.5	96
N Ireland	4.9	0.4	51.1	120	95.2	83

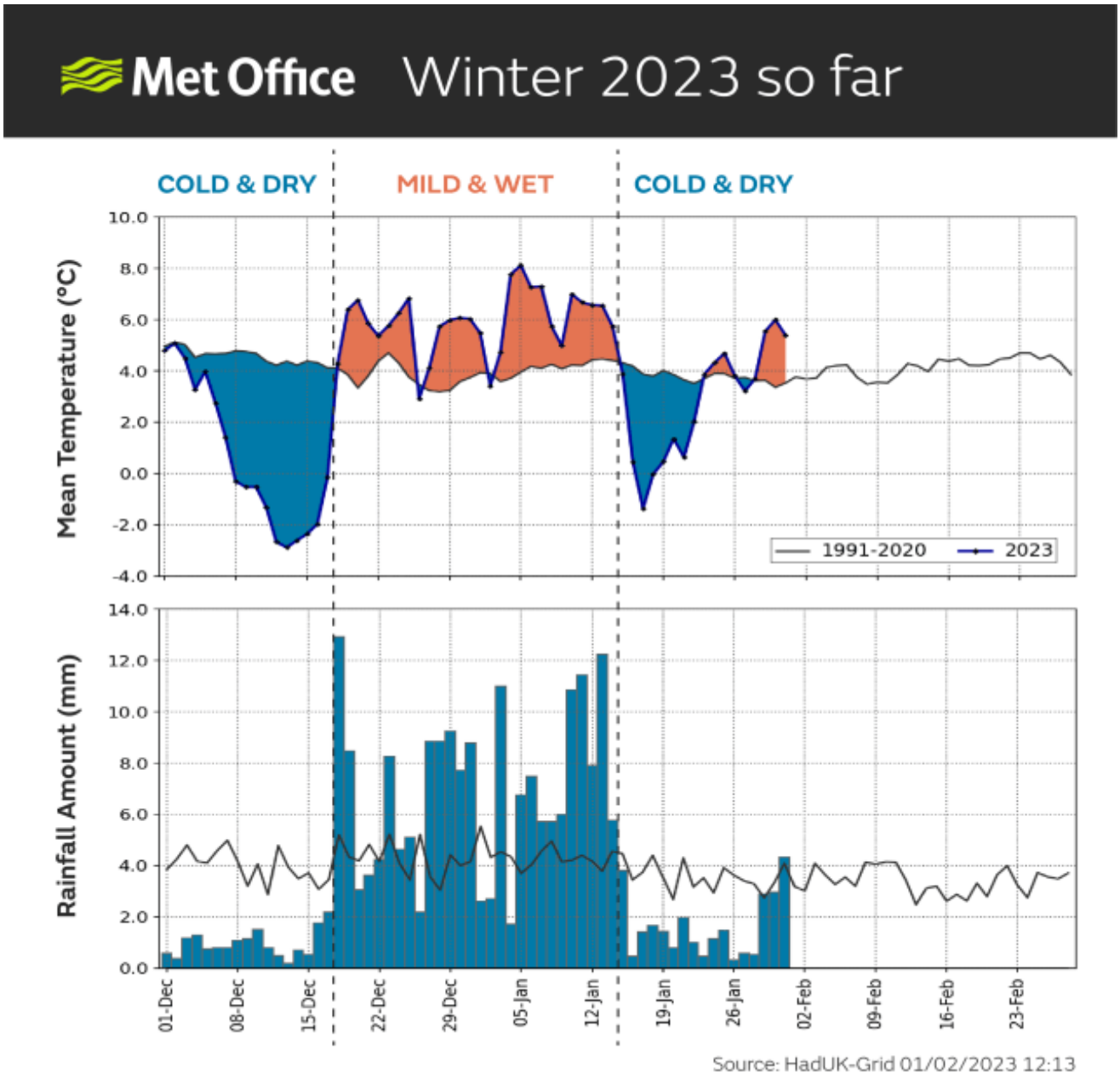
A typical winter so far

Two months into meteorological winter, the statistics are remarkably near average for rainfall and sunshine so far.

At this point in the season, you’d expect 68% of winter’s average rainfall and sunshine. At the conclusion of January, both of these are at 69%, though there have been obvious fluctuations, as is normal in a UK winter.

So far, there has been 236.7mm of rain for the UK in winter, though areas in the south of the UK have generally seen more rain compared to their averages.

During winter, rainfall and temperature can be closely linked, with wet weather generally linked to mild temperatures when Atlantic weather systems bring milder more unsettled conditions, and dry weather is associated with colder conditions when the UK is under the influence of air from the north or east.



Winter 2023 so far with mean temperature and rainfall amount

During the period between 18th December and 15th January, the UK received over 162.6% of average Jan rainfall. During this time Wales received 212.6%. This was certainly a notably wet winter period, but not record breaking, and not as wet as equivalent spells in February 2020 or Jan 2016.

Winter so far has been slightly cooler than average for the UK with the mean temperature from December and January sitting at 3.6°C, which is 0.5°C cooler than average.

Date Created
February 2023

Will there be a Beast from the East or not?

Description

The indications are that we could see some colder weather next week, but how cold and are we facing another Beast from the East?

It looks like we will start to see a change from the current mild conditions to a colder spell from the middle of next week (w/c 6th Feb), especially for parts of the south and east of England.

High pressure is expected to build and settle over or near to the south of the UK allowing colder air from continental Europe to cross the country. This high-pressure system will act to block the predominantly wet and windy weather from the Atlantic from crossing the UK, resulting in a spell of dry and more settled weather. The north and west of the UK is more likely to retain milder conditions and stay relatively unsettled.

It is most likely this cold spell will be typical of early February, with some frosty nights and colder days, but with daytime temperatures in mid or low single figures, lowest in the south and east.

However, there is a small chance – around 15% – that we may see an even colder, longer-lasting, and more widespread spell of very cold weather with the possibility of some impacts from wintry weather. This scenario is dependent on just where the high-pressure settles in relation to the UK.

At the moment, it looks we will see a gradual return, within just a few days, to milder conditions as wet and windy weather pushes across the country from the north and west. However, if the colder scenario does develop, the return to milder and unsettled weather could be slower for the south and east of the UK.

Keep up to date with the latest forecast on our website, by following us on Twitter and Facebook, as well as on our mobile app which is available for iPhone from the App store and for Android from the Google Play store. Keep track of current weather warnings on the weather warning page.

Date Created
February 2023

Climate change, drought and water security

Description

This month we're exploring the climate theme of 'water security'. Water Security, as defined by the World Meteorological Organization (WMO), refers to 'a population's capacity to safeguard sustainable access to adequate quantities of acceptable quality water.'

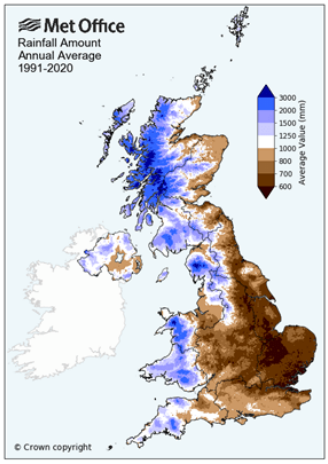
At the Met Office, we work alongside organisations in the water sector to help support resilience and planning through the provision of weather and climate data and expertise. In this blog post, we'll explore the link between climate change and water security and learn about some of the work that we have undertaken in this space.

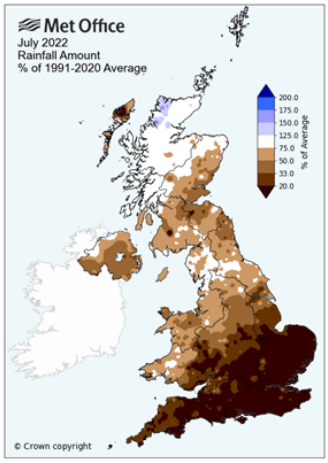
Climate change and increasing heat drought events

In November 2022, the WMO published its first State of Global Water Resources report which assessed the effects of climate, environmental and societal change on water resources. At the time, WMO Secretary-General Professor Petteri Taalas said, "The impacts of climate change are often felt through water – more intense and frequent droughts, more extreme flooding, more erratic seasonal rainfall and accelerated melting of glaciers – with cascading effects on economies, ecosystems and all aspects of our daily lives. And yet, there is insufficient understanding of changes in the distribution, quantity, and quality of freshwater resources."

As the climate continues to change as a result of greenhouse gas emissions, we are seeing increasingly hot, dry conditions in the UK and globally. 2022 has recently been confirmed as the hottest year on record for the UK with an annual average temperature of over 10°C, and this trend is projected

to continue in the future. July 2022 saw the driest month since 1935 for England as a whole, and the driest on record for East Anglia, southeast and southern England, with the UK seeing just 56% of its average rainfall for the month. As a result, drought was declared by the Environment Agency in many parts of the UK in August 2022.





Impacts of drought on water security

Rising temperatures and increasing instances of drought events could have significant implications for water security. In 2020, the Environment Agency published a National Framework for Water Resources which showed that under the current trajectory, the amount of water available in England could be reduced by 10-15%, with some rivers seeing up to an 80% decrease in water during the summer months.

An Environment Agency spokesperson said: “Our climate is changing; the summer of 2022 demonstrates this. Action must be taken now, to ensure we are ready for managing droughts in the short term. As our National Framework for Water Resources shows, we need to develop new sustainable long-term supplies of water and for people and business to use water wisely to protect our precious water resources. In the short term the Government, Environment Agency, water companies, farmers, environmental and angling groups continue to work together through the National Drought Group to balance water needs and manage impacts if we experience prolonged dry weather again.”

How can we respond to threats to water security?

Climate change projections indicate that rainfall patterns in the UK will shift, which could present additional water security challenges to regional water providers. It is vital that water companies have access to the latest research, advice and accurate meteorological projections, so that they can effectively manage water supplies in their area.

The Met Office has been working with water company Anglian Water to support water resource management for the East Anglia region, one of the areas which is projected to be most affected by water scarcity.

By using novel approaches and new datasets, the Met Office worked alongside Anglian Water to strengthen their understanding of drought risk – both for today and for the future, in a warmer world. This improved understanding enables Anglian Water to enhance their resilience to future drought events.

Dr Joe Osborne is an Industry Consultancy Manager at the Met Office. He said: “As part of this work, the Met Office Industry Consultancy team has developed a statistical model to enhance Anglian Water’s understanding of extreme events. The model is used to generate 1,000 alternative realisations of a 105-year historical period (1914-2018), with daily outputs on a 5km grid over the region. The output validates rainfall and drought behaviour well, providing confidence in the suitability our datasets for future scenario planning.”

At the Met Office, we provide a range of weather and climate services to help support resilience, efficiency and forward planning for the water sector. This includes investigations into historical instances and future projections of drought, river flow analysis and consultancy around climate change projections. With meteorological expertise and knowledge of the latest advances in water resource planning, our consultants can help the water sector to mitigate the impact of weather and climate, adapt to changes and capitalise on the potential benefits of future weather events (for example, average increases in winter rainfall could improve resilience of supply with the appropriate resource management solutions).

Geoff Darch, Head of Supply Demand Strategy for Anglian Water concluded: “Understanding the investment decisions that are required to protect our customers against future weather and climate extremes is paramount. We need to make decisions based on robust and defendable science. Undertaking this challenging work with the Met Office means that data-driven investments are made where appropriate, ensuring that we better protect our customers and the environment we serve in the face of an ever-changing climate.”

Date Created
February 2023

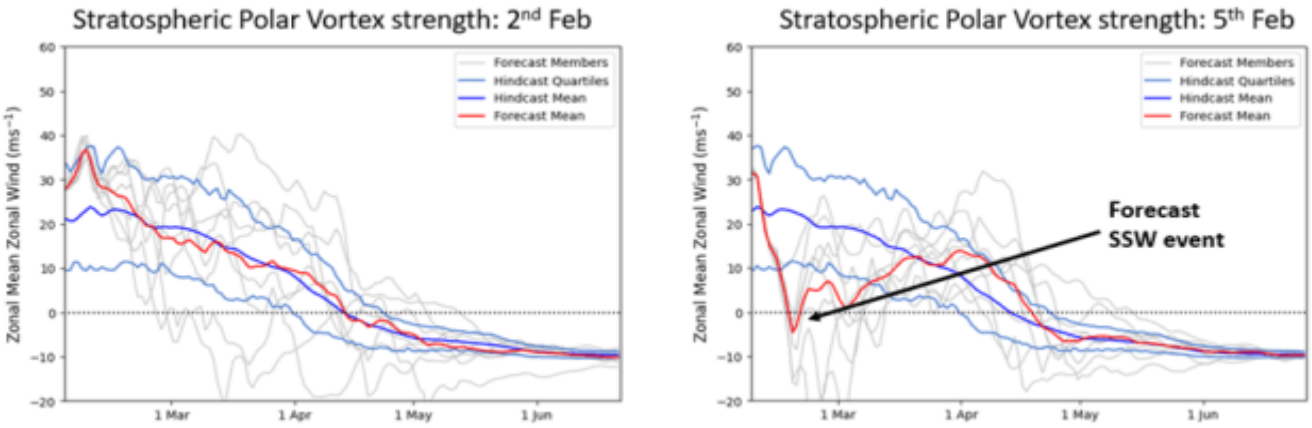
Are we expecting a Sudden Stratospheric Warming?

Description

Following a minor Sudden Stratospheric Warming (SSW) event in January, the Stratospheric Polar Vortex (SPV) has now recovered. Our forecasts for the coming week also suggest that conditions will become milder. So why does there continue to be speculation that cold weather is on the way for the UK with snow and ice for many?

The latest forecasts are showing that a major SSW is now likely to take place. The recent minor SSW weakened the SPV and it's now likely to collapse and reverse in the middle of February.

A major SSW often makes the jet stream meander more, which can lead to a large area of blocking high pressure over northern Europe, including the UK. This blocking high pressure can lead to cold, dry weather in the north of Europe, including the UK, with mild, wet and windy conditions more likely for southern areas of the continent. However, this is not always the case and impacts on UK weather can also be benign when an SSW occurs.



Prof Adam Scaife, Head of Long-Range Forecasting at the Met Office, said: "There is now over 80% chance of a major SSW occurring. Although the impact will become clearer nearer the time, any effect on UK weather is most likely to occur in late February and March."

Other factors can also impact the UKs weather in winter such as the Madden Julian Oscillation which is now also tracking towards a state that favours a cooler spell in late February.

In the meantime, it is important to remember that the occurrence of an SSW does not always equate to a 'Beast from the East' type scenario even though this happened in 2018. For example, in 2019, there was an SSW but little impact on the weather for the UK and NW Europe.

The current extended range forecast for mid-February suggests that the most likely scenario is for broadly changeable weather with westerly conditions and influxes of wind and rain at times, particularly in the northwest. Temperatures are likely to be around average through mid-February. We will be

updating forecasts with a close view on late February and early March as the SSW unfolds.

Date Created
February 2023

The beautiful game in a changing climate

Description

Climate change is projected to impact the seasonality and intensity of extreme weather events, with more heavy rainfall occurring in the autumn in the UK – but what does this mean for the future of the UK's most popular sport? As part of our Get Climate Ready campaign, we've been looking at the impact severe weather, in particular heavy rain and flooding, has on UK football.

Flooded football field, Image: Shutterstock

What is the science telling us about our future climate?

The latest UK Climate Projections (UKCP18) noted that there is an increased chance of warmer, wetter winters and hotter, drier summers as our climate continues to change. UKCP Local projections show that climate change is projected to bring about a change in the seasonality of extremes, in particular heavy hourly rainfall intensity in the autumn. This will impact on the frequency and severity of surface water flooding (pluvial flooding) particularly in urban areas. Hourly rainfall extremes that are responsible for flash flooding are expected to increase with climate change.

Elizabeth Kendon, Met Office Science Fellow, said "The UK has experienced unprecedented rainfall events in recent years, and since 1998 the UK has seen six of the ten wettest years on record. British weather is notoriously variable, making it difficult to identify underlying changes in rainfall extremes above natural variability. However, a number of recent Met Office attribution studies have shown that some recent heavy rainfall events in the UK associated with flooding can be linked to human-caused climate change. Events such as the wettest February on record in 2020, or the record-breaking rainfall

seen on 3 October 2020, are expected to become more frequent by 2100 due to climate change."

Why are we talking about football and climate change?

Football is the UK's most watched and played sport – in 2021 roughly 1.5 million people in England played at least twice a month.

UK football is already experiencing the impacts of heavy rainfall and flooding events. In 2007 significant levels of rainfall caused the river Don to burst its banks, flooding Sheffield Wednesday's Hillsborough Stadium. In 2015 torrential rain accompanying Storm Desmond saw Carlisle United's Brunton Park flooded, and the club was forced out of the stadium for seven weeks.

These events may act as a glimpse into the future of the sport, and a recent study (Rapid Transition Alliance (Playing against the clock (2020)), reported that by 2050, a quarter of UK football grounds will be flooded.

Abingdon Football Club Flooded, February 2021. Image: Shutterstock

Football for Future is seeking to build a more sustainable culture in football, raising awareness of the relevance of climate change and supporting the industry to become more environmentally sustainable. Barney Weston, Director at Football for Future, said; "Climate change is the defining issue of our generation. We are seeing that the football community is waking up to the importance of taking action

and Football For Future are working with clubs – from the Premier League to the non-league – to help them understand what that looks like for them."

Grassroots football in action. Image: Grahame Madge

Grassroots at risk – what action is needed?

Though the impact of severe weather at football grounds and pitches is dependent on the level of exposure and vulnerability, grassroots football pitches are also at risk. The last comprehensive survey of grassroots football (Sports and Recreation Alliance (2014) Alliance Survey referenced in Rapid Transition Alliance: Playing against the clock (2020)) revealed that on average, around a third of grassroots pitches are already losing six weeks to two months of the year from flooding due to severe weather.

Grassroots football clubs provide enormous value to communities, offering a low entry barrier to the sport. Whilst these clubs don't have access to the funds of league clubs, there are actions that can be taken on climate change. Individuals and the club as a whole can consider actions to reduce greenhouse gas emissions – mitigating against climate change will help minimise the worst impacts in future. Clubs can also consider how they can adapt to a changing climate, with good maintenance practices important to ensuring high quality pitches. We reference guidance on this on our football and climate change webpage.

Raising awareness and encouraging action

Last weekend from 3-5 February 2023 was the first ever Green Football Weekend. The event brought together 80 of the UK's professional football clubs, fans, families and communities to 'unleash the

power of football on climate change'. People were encouraged to take climate-friendly actions to 'score green goals' for the club they support, with over 80,000 goals scored over the course of the weekend.

Over the weekend itself, clubs across the football divisions held greener games, making their fixtures as carbon-friendly as possible through activities such as subsidising public transport for fans, using reusable bottles, announcing new commitments and even distributing wildflower seeds to fans. 40 clubs wore green armbands to show their commitment to tackling climate change.

Sarah Jacobs from the Green Football Weekend team said: "Climate change is already having dire consequences for football, from flooded pitches to sweltering summer temperatures. Football clubs and fans have a critical role to play in protecting our world. It's brilliant to see the power of fan action inspiring clubs and the whole football community to be more ambitious."

Talking football and climate change

Last week, Met Office meteorologist and presenter Alex Deakin caught up with Sarah and Barney as well as Met Office Science Fellow Professor Lizzie Kendon in a live Twitter Spaces conversation. You can listen to this on-demand to hear what they had to say ahead of Green Football Weekend.

Find out more by following #GreenFootballWeekend, #GetClimateReady and @ftblforfuture

Met Office
Is the game we love at risk?
It's time to get the ball rolling on climate change.
#GetClimateReady visit www.metoffice.gov.uk/getclimateready

Date Created
February 2023

Is the future of Alpine skiing all downhill?

Description

In the latest episode of the Met Office Mostly Climate podcast, Dr Rosie Oakes discusses climate and the future of Alpine snow sports with Carlo Carmagnola – a Grenoble-based snow scientist with Meteo France.

Alpine snow sports generate significant income for the regional economy. Image: Shutterstock

The first few days of 2023 saw exceptional warmth across much of central and western Europe. With temperatures exceeding 20°C, many records were broken – the warm air was extensive as even the snow-lined Alpine landscape became punctuated with broad patches of rock, soil and grass.

Good winter snow conditions are a significant source of tourism revenue. Delicate ecosystems rely on natural winter snow cover, locking in water for healthy spring growth. While the albedo effect means the snow reflects sunlight and limits temperature rise. The melting event of early January was not welcome.

The prospect for snow sports?

Carlo studies the properties of Alpine snow, and how climate change will impact snow cover in local ski resorts. A particular interest is the balance between natural snow cover and the creation of artificial

snow.

A snow cannon producing artificial snow. Image: Shutterstock

Making artificial snow is standard across numerous Alpine resorts. It plays a critical role through the pre-season and during times when no natural snow is expected. The process requires: water, often sourced from nearby reservoirs; air temperatures between -1°C to 6°C; low humidity air; and light winds.

Artificial snow comes with a number of caveats – it requires considerable use of energy and water. And, if followed by warm temperatures, all that you've produced may simply melt away.

Future planning

Anticipating the state of snow through a week, month, season is one thing; future planning for decades ahead requires a greater level of information.

Climate projections are key to understanding the distribution, quality of snow and ice cover; and therefore the future of snow sports.

The future climate depends on how much carbon-dioxide is released into the atmosphere linked to human activities, especially the burning of fossil fuels. There are many climate scenarios describing these futures and the team use these to understand future impacts.

Carlo is clear temperature is the main limitation for snow cover. He said: "Interestingly, climate projections don't show decreases in snow fall, but rather increases in melting rate; the impact of which

will vary across resorts. At higher elevations there will usually be more snow due to the lower temperatures.

“Below 1500 metres it gets more complicated. The aspect or direction that a slope faces are also key factors impacting melting rates. Computer simulations integrate climate information with snow management, but when it comes down to it – it’s all dependent on future greenhouse emissions.”

The results from Carlo’s studies show skiing will still be viable in the Alps, but there is likely to be a slow degradation of the conditions, with lower-elevation resorts generally doing less well than the high-elevation ones.

What will happen to Alpine snow?

Skiing Vallee Blanche Chamonix with amazing panorama of Grandes Jorasses and Dent du Geant from Aiguille du Midi, Mont Blanc mountain, Haute-Savoie, France. Image: Shutterstock

Carlo concludes: “In 30 years, skiing should still be possible across the Alps, but there will be a great dependence on snowmaking. And in some resorts, even with the addition of snowmaking, you will not be able to ensure a long enough season for your customers.”

For presenter and climate scientist Rosie Oakes, Carlo’s work has wider significance: “As well as enabling resorts to plan for climate change, the research carried out by Carlo’s team prompts wider questions about of the impact of climate change on the global economy and the climate-dependant activities people currently enjoy.”

Listen to the full conversation on the latest episode of the Mostly Climate podcast.

Date Created
February 2023

Counting on technology in a changing world

Description

Ever-increasing impacts from climate change, including more frequent and intense bouts of extreme weather, are among the greatest challenges faced by mankind.

A changing climate is a daunting prospect. But, says the Met Office's Theo McCaie, there is one ally standing increasingly firm in our corner: technology; in particular, the benefits from machine learning and artificial intelligence.

Theo McCaie – one of a team spearheading the Met Office's data science capability. Image: Simon Hammett.

We are in the midst of an artificial intelligence revolution where the world's fastest-growing deep technology has the potential to rewrite the rules of entire industries, fundamentally changing the way we work and live.

Data science advances – including machine learning and artificial intelligence – mean computers can now analyse, and learn from, vast volumes of information at high levels of accuracy and speed, providing exciting new opportunities.

To maximize the advantage of these technological breakthroughs, many scientific disciplines –

including weather and climate science and prediction – are revising their operating plans. For example, the Met Office recently published its Data Science Framework outlining how we will 'harness the power of data science to push the frontiers of weather and climate science and services.'

There are already promising signs for embracing machine learning in weather and climate. Building on reanalysis data (a fusion of observation data and numerical weather models) several tech companies have produced exciting research indicating similar accuracy to traditional weather forecasting techniques as a fraction of the compute cost at run time.

Embracing change

Professor Kirstine Dale, Principal Fellow for Data Science at the Met Office, said: "These results are encouraging and show the benefits that can be gained using machine learning to build upon a rich observation platform, physics-based modelling and data assimilation.

"Critically, these developments pave the way for a hybrid approach bringing together the strengths of both data-driven and physics-based approaches to weather forecasting.

"At the Met Office we are developing systems which will harness the benefits of both physics-based and AI approaches. For example, by using physical models to produce expensive, but high-quality, data that can be used to train fast AI-based emulators."

A fundamental principle of most AI is that it needs to be trained. The Met Office has rich data sets from a wide spectrum of spatial and time scales which provide a unique training resource. Added to this rich data set is a wealth of knowledge and models based on the physical laws that define how the earth works.

Kirstine added: "Combining these assets, using cutting-edge AI research in a trustworthy and reliable way is at the core of what we are doing at the Met Office."

Working with partners

Such a large and important challenge cannot be tackled alone. The Data Science Framework highlights 'partnership' as a core pillar to success. One particularly exciting project is fusing machine learning and meteorological expertise from across the Met Office and our partners. Using cloud-scale computing and big data our experts are leading research into AI-based systems for forecasting UK weather. Progress in this area is also timely. Ever-increasing weather extremes and growing climate change impacts means we can draw together our combined skills and experience to tackle challenges identified in IPCC reports.

Professor Simon Vosper, the Met Office's Director of Science, concluded: "Machine learning and artificial intelligence are among the fastest growth areas of science. We are excited to incorporate the valuable benefits of these technologies within our weather forecasts.

"In an era of ever-increasing weather extremes and growing climate change impacts, we believe the most promising developments will come from fusing the benefits of all these technologies rather than simply relying on one or the other."

Date Created
February 2023

One year on from three storms in a week

Description

It’s one year since three named storms impacted the UK within seven days in what was the stormiest week since storm names were introduced for the UK in 2015. Here, we look back on what was a week to remember for UK weather.

February 2022 – a historic week for UK storms

Storms Dudley, Eunice and Franklin impacted the UK within seven days, with Dudley impacting the UK on 16-17 February, Eunice 18 February and Franklin 20-21 February. It’s the first time three storms were named in a week since storm naming was launched for the UK in 2015.

This period of severe weather was signalled well in advance, with the Amber warning for Storm Eunice the longest-range Amber wind warning ever issued by the Met Office.

The subsequent red warnings for wind for Storm Eunice highlighted the danger to life and an exposed site on the Isle of Wight recorded England’s highest ever gust speed of 122mph. This was one of the UK’s most severe storms since February 2014.

Warnings for the storms helped reduce impacts, with over a fifth fewer vehicles on the roads thanks to Eunice warnings and Met Office forecasts helped partners like the national air traffic control service, NATS, land planes safely in challenging conditions.

Storm Eunice brought widespread impacts to much of the UK. Image: Shutterstock.

Severe weather hasn't been hard to come by since those wind warnings in February 2022. A summer of record-breaking heat, including a drought for many, followed by a December cold snap and even some mid-winter heavy rain, has meant the weather hasn't been far from the headlines.

Preparing for severe weather

The Met Office's Will Lang leads the team responsible for weather preparedness and is a spokesperson for WeatherReady – a partner-led initiative with useful weather tips, advice and practical guides.

Looking back on the storms from a year ago, Will said: "February 2022 was a stark reminder for the public of the impact severe weather can have.

"While warnings helped to mitigate the impacts, one of the best ways for the public to be prepared for severe weather is to take action before the weather turns severe and we know that's what many people did ahead of Storms Dudley, Eunice and Franklin."

Name, but no shame

Storms have been named for the UK since 2015, with names chosen in partnership with Met Eireann and KNMI on naming low pressure systems that are deemed to have the potential to cause medium or

high impacts in an area. For the Met Office, this would typically mean an amber or occasionally a red warning.

Met Office post-event surveys revealed that more than 98% of people within red warning areas for Storm Eunice were aware of the warning, with around 90% of those taking direct action to protect themselves or their property from the severe weather in the forecast.

Will added: “Storm naming works. It provides a single authoritative system of communicating the weather to the public, helping people keep themselves, their property and businesses safe. Storm Eunice demonstrated this excellently, helping to ensure partners, the media, responders and the public had the information they needed to stay safe in severe weather.”

Storm Otto, which has been named by the Danish Meteorological Institute, impacted the UK on 17 February 2023. As a result, the first named storm on 2022/23’s list of storms for the UK is currently unused, with Storm Antoni the first name on the list.

Date Created
February 2023

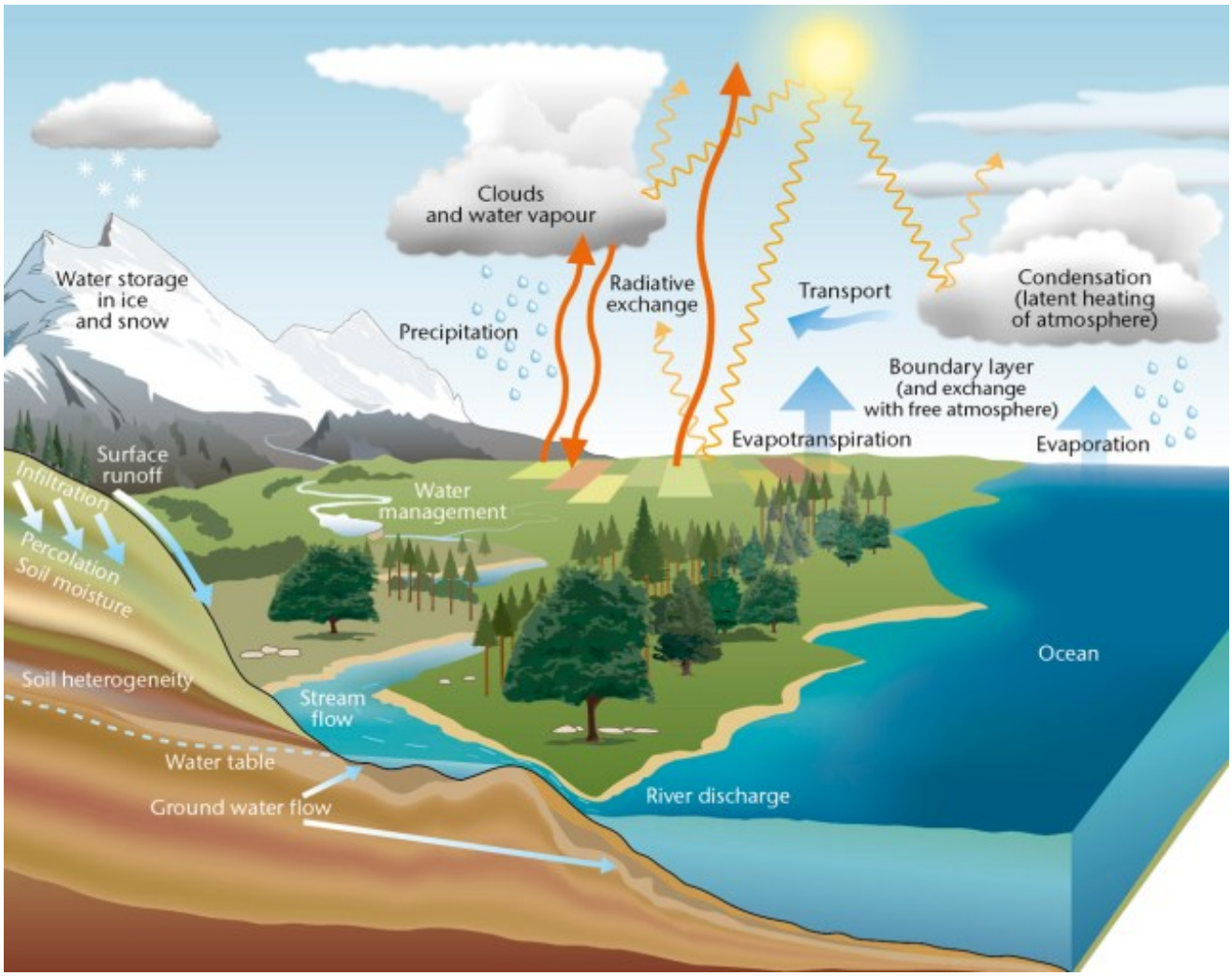
Water security and the global water cycle

Description

Throughout February we've been focusing on the climate theme of 'water security'. To understand water security, we first need to understand the way that water travels around the Earth. In this blog post, we'll learn about the global water cycle, which refers to the way that water moves around the world, and the implications that this can have for water security in different regions.

In short, the 'water cycle' (also known as the hydrological cycle), refers to the continuous process whereby water is transferred between the surface of the earth and the atmosphere. When the sun shines on water on the Earth's surface, the heat of the sun warms the water, turning it into an invisible gas – water vapour. This process, the changing of water into a gas, is called evaporation. Water vapour enters the atmosphere in other ways too; through transpiration, (when water vapour is released from plants) and sublimation (when ice or snow turn into water vapour without melting into water first).

Water vapour rises into the sky. The further you move up and away from the earth's surface, the colder the temperature gets. Therefore, when it gets high enough, the water vapour cools and changes back into tiny water droplets. This change is called condensation which is the opposite of evaporation.



Clouds are made up of tiny water droplets and when condensation occurs in the sky, clouds form and grow. When water droplets bump into one another, they stick together and increase in size. They continue to grow until they're too heavy and begin to fall as rain, snow, sleet or hail. The water droplets even continue to grow as they bump into one another on their journey from the cloud to the ground. Every single raindrop that reaches the ground is made up of 1 million of the original tiny water droplets!

Rain clouds pictured over boats in the sea at sunrise in Cornwall, UK. Image: Shutterstock.

When precipitation occurs over land, some water seeps into the ground as groundwater, a small amount is taken up by plants and animals, and the rest will return to rivers and streams as surface run-off to begin its journey back to the oceans. From here the whole process begins again.

The water cycle is happening all around us, all the time. It keeps water moving between the ground and the sky, providing the water needed for plants, animals and people to survive.

Water vapour is carried around the planet by the winds, with some regions such as tropical rainforests receiving much more water vapour and rainfall than other regions such as deserts. In places where water demand from human societies is greater than water availability, this can lead to a lack of water security.

Climate change, the water cycle and water security

Recent IPCC reports have confirmed that human activities are influencing climate change, which is resulting in more frequent and extreme weather events, with instances of intense rainfall and extreme drought both expected to increase.

Climate change is already affecting the water cycle. Globally, on average, climate change leads to higher evaporation and more rainfall. Heavy rainfall in particular is becoming even more intense, which can lead to a greater risk of flooding.

On a local scale, these changes in the water cycle are much more complex, with some regions getting

drier and others getting wetter. For example, regions that are already dry, such as many countries surrounding the Mediterranean, are likely to become more so due to climate change. This increases the likelihood that existing problems such as concerns over water security will worsen.

Met Office consultancy for water management
In addition to providing weather forecasting and climate science services, we work with companies in the water industry to assist in the management of water resources by supporting strategies for effective resilience, efficiency and forward planning. This can include investigations into instances of drought and climate change consultancy to enable companies to overcome challenges to water security.

Learn more about our water consultancy services on our website.

Date Created
February 2023

Freddy: one of the longest-lived tropical cyclones

Description

Tropical Cyclone Freddy, which has just rocked Madagascar, has been barrelling through the tropical Indian Ocean for 16 days – making it one of the longest-lived systems in the southern hemisphere. It developed on 6 February off the coast of north-west of Australia and has affected island nations, including Mauritius, during its passage.

Julian Heming is a tropical cyclone expert with the Met Office. He said: “Once making landfall over Madagascar, Freddy has begun to fall apart, but the forecast models are expecting it to reform again over the Mozambique Channel – the strait separating Madagascar from continental Africa – before making a second landfall in Mozambique itself.”

Freddy made landfall just south of Mananjary, in Madagascar on Tuesday evening, with estimated 10-minute sustained speeds of 100 mph, gusts to 150 mph and a storm surge of up to one metre at and just south of the landfall location, with waves of up to 13 metres on top of the surge.

Freddy reaches the west coast of Madagascar early Wednesday evening (local).

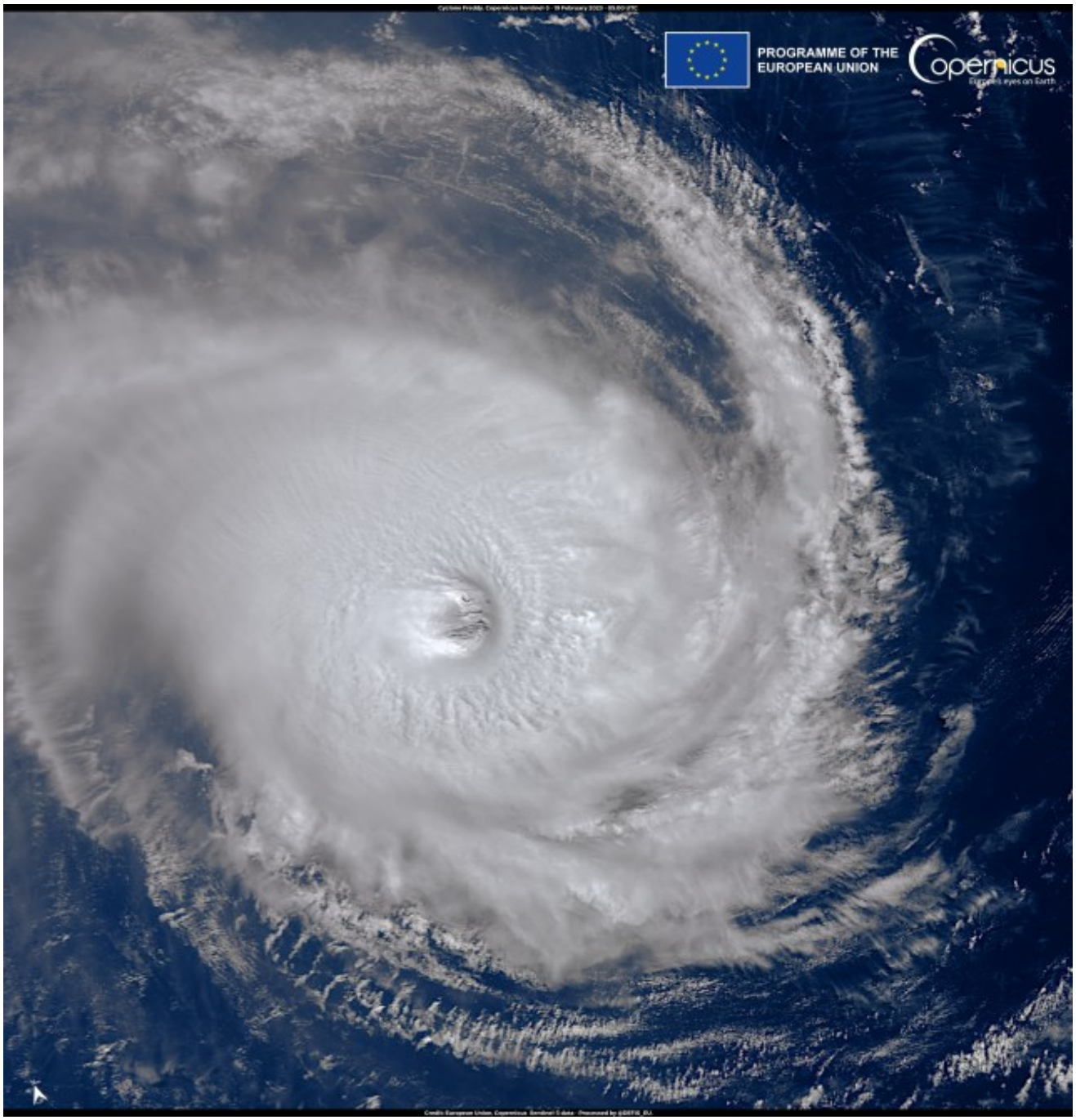


Image: European Union, Copernicus Sentinel-3 imagery

Michael Silverstone is an Expert Operational Meteorologist with the Met Office global guidance unit. He said: “Heavy rain will affect the usually drier west of Madagascar, with 50-100 mm expected here, which is about half the February average. Later, Freddy is likely to begin strengthening again as it moves into the Mozambique Channel, becoming a severe tropical storm and maybe even regaining tropical cyclone status prior to an expected second landfall on the coast of Mozambique between Inhambane and Beira on Friday morning.

“It is likely to bring a smaller storm surge here than occurred over eastern Madagascar. Rainfall is likely to be the main hazard, with widely over 200-300 mm and locally over 500 mm of rain expected late this

week and into the weekend over a large area across central and southern Mozambique and into eastern Zimbabwe, northeast South Africa and Eswatini (the average February rainfall for the affected area is roughly 100-200 mm).

“Coastal flooding and damaging, possibly destructive, winds are expected close to the landfall location in south-eastern Mozambique Friday morning, although this likely be less impactful than was seen in Madagascar. For mainland south-eastern Africa, the very heavy rainfall coming on top of a very wet recent spell will pose a significant threat of widespread flash and riverine flooding late this week and through this weekend, with an enhanced landslide threat too.”

Tropical cyclones acquire their energy from the ocean. Freddy may not have the capacity to rebuild into such an intensive system while crossing the Mozambique Channel but the main concern is the amount of moisture the system has wrapped up within it.

Julian Heming added: “Some of the forecast models are suggesting that Freddy could become quite a slow-moving system effectively hanging over Mozambique for several days unleashing extremely high rainfall totals over the country and neighbouring coastal regions. This might cause real flooding problems.”

The record for the longest-lived tropical cyclone for the southern hemisphere is Cyclone Leon-Eline, which happened in 2000, and that was a tropical storm for 18 and a half days that took a very similar track starting to the north west of Australia. It then struck Madagascar and then reformed and restrengthened in the Mozambique Channel and then went on to make landfall over Mozambique.

There is an association between the development of these long-lived tropical cyclones in the South Indian Ocean and the La Niña (cool) phase of the El Niño Southern Oscillation cycle in the tropical Pacific. There is currently a La Niña in the tropical Pacific: the third in three successive years.

Julian Heming added: “Leon-Eline and its associated flooding happened at the end of a very long, prolonged La Niña period which also produced flooding over Mozambique. It looks like we could get a similar flooding situation over the next few days in Mozambique.”

Date Created
February 2023

Dry February so far for most

Description

With less than a week of February to go, conversations are already being had about how dry the month has been, and what impact this could have.

This month, we've been exploring the theme of water security and climate change. But in more granular detail, February 2023's lack of consistent rain for most of the UK underlines some of the common differences between weather and climate, and where there's an overlap in challenges.

The summer of 2022 saw record-breaking temperatures when 40.3°C was recorded for the first time in the UK. The first eight months of that year were also the driest since the infamously dry start to 1976. With these notable weather events in mind, water resources have often been in the news, and a drought was declared by the Environment Agency for many parts of the UK in August 2022.

That declaration of drought was subsequently removed for most areas as Autumn rainfall topped up resources for many, though not all.

Drought comes down to a range of factors and is much more complex than just rainfall amounts, with hydrology, geography and infrastructure also influencing drought conditions and the availability of water in the UK's reservoirs. However, a dry February has led to some speculation about weather trends in recent weeks.

Month so far

Up to 20 February, you'd expect to have around 71% of the month's total average rainfall. However, the UK has currently had just 36% (34.5mm) so far, according to provisional Met Office figures.

High pressure has been largely responsible for a dry first half of February.

But when you look into the regional data, the lack of rainfall becomes more marked. While Scotland has so far had 59% (83.5mm) of its average February rainfall, the south of England has had just 6% (3.8mm). For England it has been the driest 1st to 20th February since 1993.

Some individual counties also stand out due to a lack of rainfall. Hertfordshire has had an average of just 0.7mm of rain so far this month – just 1% of its average for the whole month. At the time of writing 14 counties in central and southern England had recorded less than 2mm of rainfall so far this month.

Of course, these figures will change by the end of the month, but it does give an indication of quite how dry this February has been so far. For many of these areas the dry spell began in mid January. Pershore in Worcestershire for example has had just 1.6mm of rain since 15th January and for many counties of central and southern England the period from mid January to now has been a notable, but not record breaking, winter dry spell.

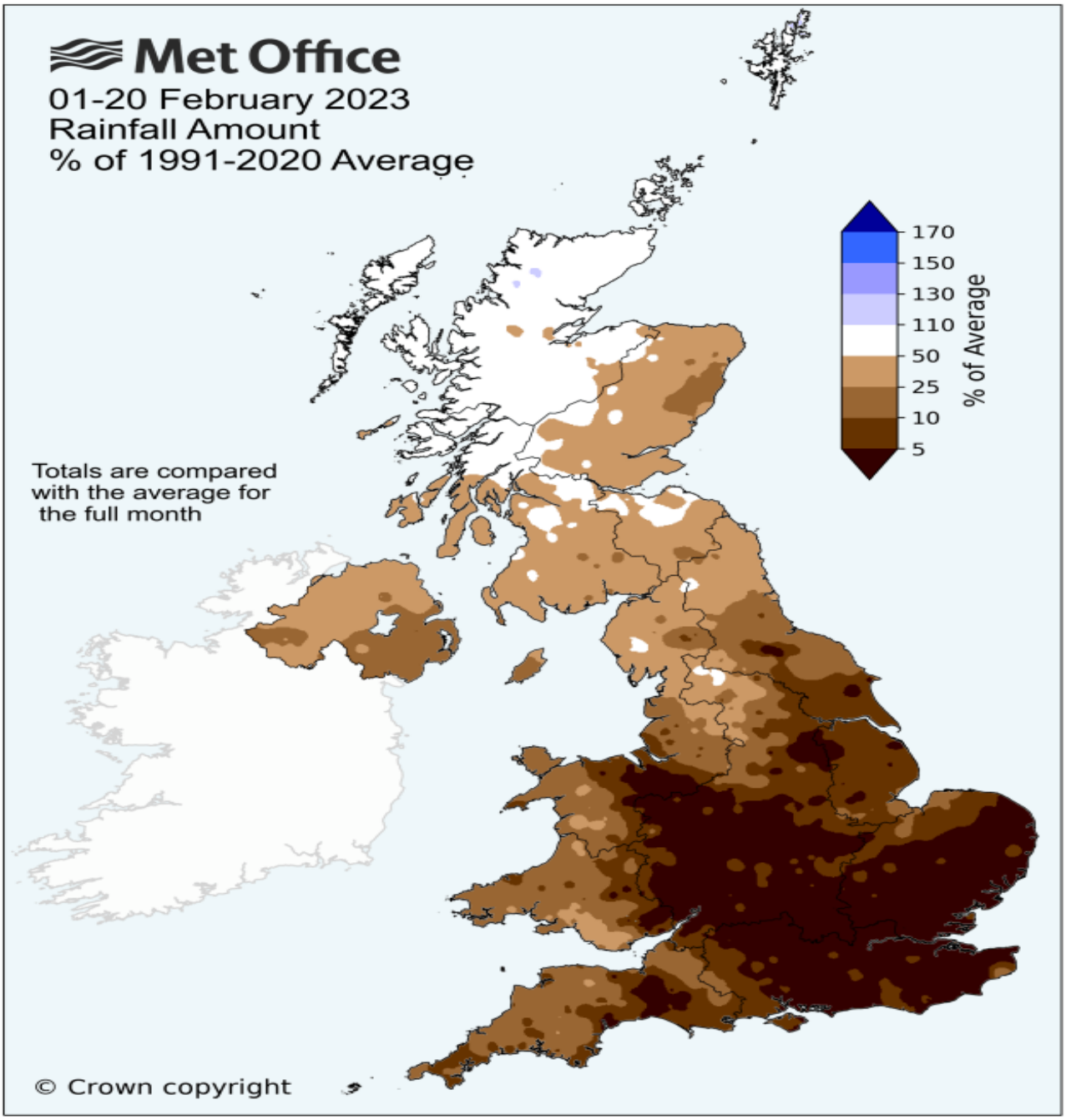
Mark McCarthy is the manager of the National Climate Information Centre at the Met Office. He said: “Although there’s still around a week left of February, it has been a notably dry month so far, especially in the south of England.

“In short, high pressure has been dominant over the UK, helping to repel rain-bearing systems across much of the country, though many have managed to influence north-western areas at times.”

Sam Larsen, Director of Programmes and Planning at Water UK, said: “Water levels in the environment began to pick up following last summer’s drought conditions, but low rainfall this month

means a majority of UK rivers are below normal levels for this time of year, meaning there is less water available for nature, agricultural abstraction, and public water supply.

“It remains to be seen whether rainfall levels will pick up before summer. This, along with the lasting impacts of climate change and population growth, means it’s absolutely vital that we all continue to save water and help safeguard against potential future drought conditions. For hints and tips on how to save water, money and energy, visit www.watersworthsaving.org.uk.”



It has been notably dry in the south of England.

A changing climate and natural variability

Climate change projections show an increasing likelihood of hotter, drier summers and warmer, wetter winters, though the natural variation of rainfall patterns in the UK means this won't be the case every year. The month of February is itself a good indicator of the variability of the UK climate with the driest month for the UK in a series back to 1884 being February 1932, when just 9.5mm of rain fell. In contrast, February 2020 was the fourth wettest month on record with 213.7mm of rain.

Mark continued: "A wet Autumn last year helped to recover some of the rainfall deficits built up through the earlier part of 2022, but the winter has seen two long dry periods firstly in early December and then from mid-January and through February, interspersed with a more notably wet and unsettled period in late December and early January. This reflects the variability of a UK winter which is an important consideration when considering the challenges presented by both short-term weather events and longer-term changes in our climate."

The figures sited in this blog are provisional Met Office figures up to 20 February 2023.

Date Created
February 2023

Working for climate resilience with the UK water sector

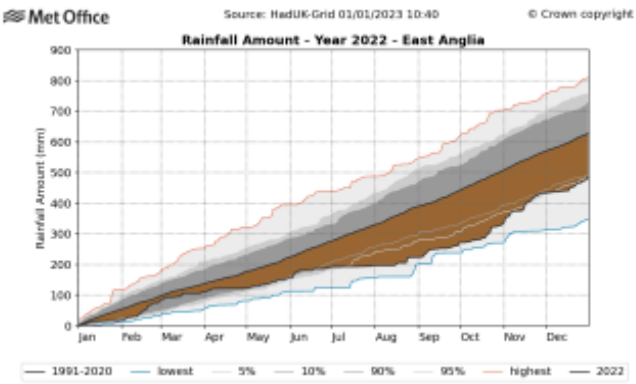
Description

2022 will be remembered for several meteorological events, including record-breaking heat and a prolonged drought. Eastern England was at the forefront of both events with East Anglia being the driest region in the UK relative to normal for the year.

Across the region, 2022 was the eighth driest year since 1836. During the year the region saw just over three-quarters (76%) of its annual rainfall, amounting to only 475.4mm.

Water security is this month's Met Office climate theme. In this blog, Met Office Industry Consultancy Manager – Joe Osborne – describes his passion for ensuring the water industry work with world-leading weather and climate science.

Weather and climate events account for many of the key impacts on the water sector, especially in East Anglia. Translating the latest datasets and science into actionable information for decision-makers remains a substantial challenge. I am driven to ensure that organisations are resilient to present-day climate and prepared for future climate.


Met Office
Source: HadUK-Grid 01/01/2023 10:40
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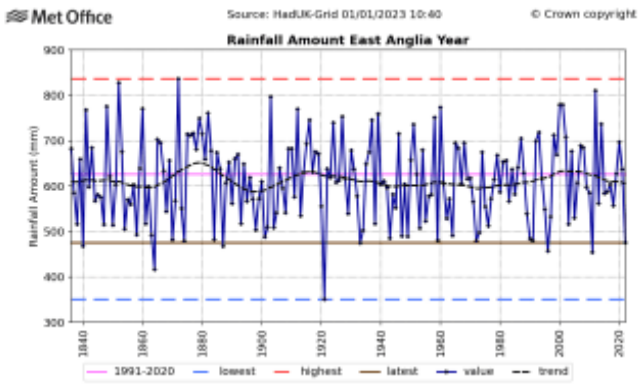
Rainfall Amount - Year 2022 - East Anglia
Rainfall Amount (mm)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1991-2020 lowest 5% 10% 90% 95% highest 2022


Met Office
Source: HadUK-Grid 01/01/2023 10:40
© Crown copyright
Rainfall Amount East Anglia Year
Rainfall Amount (mm)
1840 1860 1880 1900 1920 1940 1960 1980 2000 2020
1991-2020 lowest highest latest value trend

In my role as an Industry Consultancy Manager at the Met Office, I work closely with the UK water sector to ensure that our world leading weather and climate science is useful, usable and used.

How I got here

I joined the Met Office Industry Science and Consultancy team in June 2019, with a background in both weather and climate science and a particular interest in the hydrological cycle. I recognised that my passion sat at the interface of science and end-user, and I was keen to find a role where I was contributing valuable and actionable information. As such, I was excited to find myself working on several projects with customers in the UK water sector.

Fast forward to 2022 and I find myself leading our work with the water sector as an Industry Consultancy Manager. This is a multi-faceted role which involves working closely with colleagues in our Markets division to develop, build and maintain relationships with customers in the sector. These customers range from water companies, regional groups (alliances of water companies), the industry regulator (Ofwat is the body responsible for economic regulation of the privatised water and sewerage industry in England and Wales) and external consultancies. We work closely with our customers to understand the challenges that they are facing. It is then crucial to lean on scientific expertise to propose, develop and deliver bespoke analysis to support their key decision making.

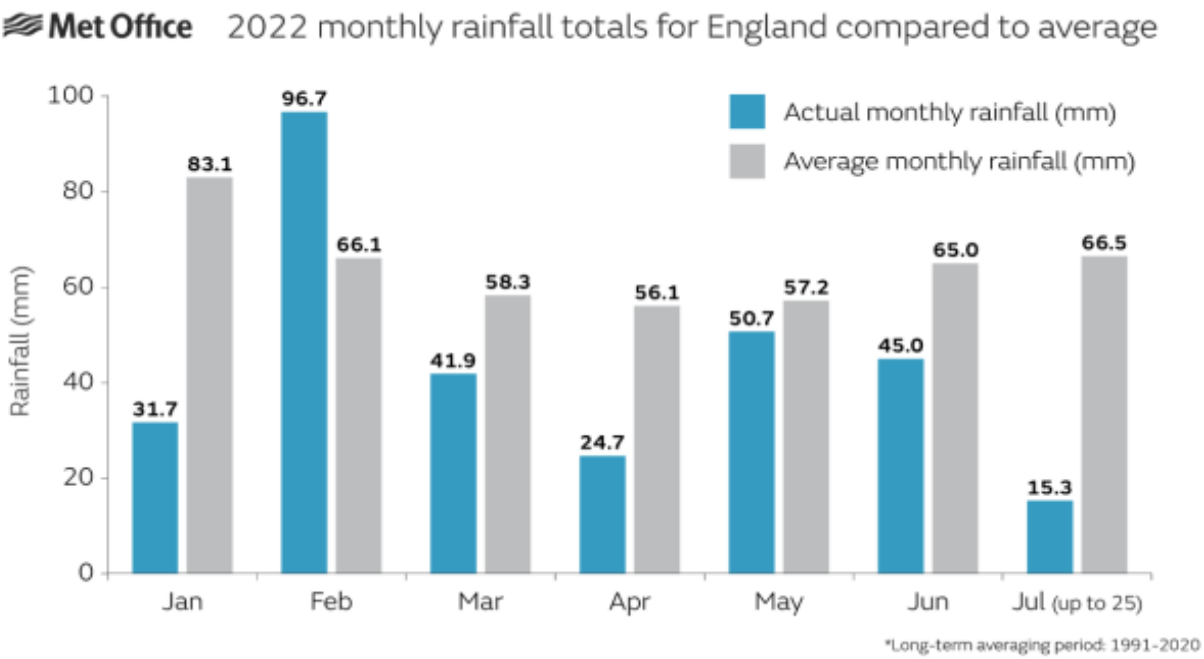
Forward planning or event driven

The work that I lead can be broadly categorised as either forward planning or event driven. Forward planning work supports customers in furthering their understanding of climate risk. In one example, using novel approaches and new datasets, the Industry Consultancy team worked alongside Anglian Water to strengthen their understanding of drought risk – both for today and in a future, warmer world. This improved understanding enables Anglian Water to enhance their resilience to future drought events.

With just under 630mm of rainfall annually, East Anglia is the driest region in the UK. Remarkably East Anglia is renowned for its diversity of wetland features and landscapes, including the Fens, the Broads and chalk streams, such as this example in Lincolnshire. Picture: Anglian Water

In other work, we are working with water companies to understand the weather drivers of key impacts, including water quality, water demand and asset deterioration (for example, pipe bursts caused by phenomena such as freeze-thaw and/or shrink-swell). We also support water companies in embedding climate information into their regulatory reporting in a consistent and appropriate manner. For example, in ongoing work, we are supporting water companies in the consistent application of climate information in their Price Review 2024 (PR24).

Despite best intentions, weather events can often present challenges to the UK water sector. Therefore, there is an event driven element to the work we deliver. The year 2022 was a demonstration of this. Beneath the headline statistics, real-world industry impacts often emerge, some of them more obvious than others. The most obvious impact was on water resources from the dry start to the year, exacerbated by the exceptionally dry and hot summer. This led to a declaration of drought across many regions of the country. The record annual warmth also contributed to the hydrological situation, amplifying evapotranspiration and soil moisture deficits.



2022 monthly rainfalls for England compared to average

The Industry Consultancy team responded to this hydrological situation by putting the weather of 2022 into a longer, historical context for water companies. The hot summer also caused additional impacts, leading to record high water demand in some areas and a reduction in water quality of some surface water supplies. Despite a general theme of warmth in 2022, the first half of December was notable for a significant cold spell. This caused considerable issues with pipe bursts, due to the freeze-thaw of water.

Innovation and influence

Fortunately, through innovation and influence, the Industry Consultancy team can support customers in preparing for and responding to these events. We provide solutions and consultancy across timescales, from short-range weather prediction through to 50-year ahead climate projections. As an example, the Met Office Industry Consultancy team has built weather impact models to enable the forecast of water demand out to 10 days ahead. We are supporting Thames Water in an Ofwat funded project aiming to extend this modelling into longer range forecasting, which will help water companies to anticipate weather events beyond 10-14 days. However, we are also innovating to ensure consistent and seamless prediction across timescales. As such, we have recently completed a project coupling these same models with UK Climate Projection (UKCP18) data to present future scenarios of water demand, supporting adaptation planning.

A unique role

The role that we play is a unique one; observing industry needs while undertaking and applying novel science. We are therefore keen to influence, to ensure that the best science is being used within the water industry. As part of my role, I work closely with our Strategic Relationship Managers to ensure that relevant insights are shared with key collaborators and government stakeholders. This is

particularly important where there may be new science or insights that could benefit the industry as a whole. The 2022 drought event (which is still ongoing in some regions) is a key example of this. Working with collaborators and sharing evidence around the changing meteorological drivers of UK drought in a warming world ensures that the resilience to such events is improved in both the short- and long-term.

We’re better together

Of course, while scientific and strategic leadership, as well as relationship management, are key to my role, the strength of our offering and delivery is due to the diversity and quality of individuals working in the Industry Consultancy team. Our diverse team is made up of statisticians, scientists, and consultants, with expertise spanning weather and climate timescales. Together we demonstrate a range of Met Office values. We’re experts by nature, contributing to and learning from world-leading science from within the Met Office (and further afield) to develop our consultancy offering. This ensures that we keep evolving; by pushing these boundaries we can make tomorrow better for our customers.

Date Created
February 2023

Which weather drivers will affect the outlook for March?

Description

March is the first month of meteorological spring. But what is the outlook for the month? Are we likely to get more spring-like weather, or perhaps something more reminiscent of winter?

The outlook suggests that March 2023 is more likely to be colder than average. But what is that likely to mean in terms of impacts?

From what we know so far – looking at some of the global drivers of weather – there are increased chances of impacts from cold weather, such as snow, frost and fog, at least for parts of the UK.

Mark Sidaway is a Deputy Chief Meteorologist with the Met Office. He said: “Although we have had a Sudden Stratospheric Warming event and other drivers pointing towards colder conditions in March, at this stage there is a low probability of having widely disruptive winter weather like that of five years ago in March 2018.

“At that time a large area of high pressure became established over Scandinavia, providing a feed of cold air all the way from Arctic Siberia. This brought intense cold to the UK.

“We are expecting an area of high pressure to become increasingly established in an area toward Greenland. This will allow a northerly flow to feed colder air into at least the northern and eastern half of the UK bringing wintry showers.

“The extended outlook shows the possibility for a series of areas of low pressure to come across the Atlantic, and these bring the potential for some more widespread snowfall as they encounter the cold air, although the location and timing of these is very uncertain for now.

“The exact positioning of the high pressure will be key and will greatly affect what weather we see in the UK.”

March 2018 was a record-breaking cold spring, which had been driven by a feature known as Sudden Stratospheric Warming. This happens when air in the stratosphere above the North Pole collapses creating a disturbance of the Stratospheric Polar Vortex – where westerly winds rotate around the North Pole, effectively hemming in the most intense cold air.

When the Stratospheric Polar Vortex breaks down it can encourage the switching of normally westerly winds to an easterly direction. Eventually, this wind reversal can reach the surface, bringing air from an easterly source. In 2018 this resulted in intensely cold air coming to the UK all the way from Arctic Siberia.

Although the globe has experienced another Sudden Stratospheric Warming episode the outcome will not necessarily be a repeat of 2018.

What can we expect from early March?

The most likely scenario is for colder and settled weather, with wintry showers perhaps affecting some northern and eastern areas (mainly coasts), at least at first.

> Will we get any snow next week? ??
>
> Watch Aidan explain what we think will happen to our weather ??
> pic.twitter.com/LER3lEH1XX
>
> — Met Office (@metoffice) February 27, 2023

This colder regime moving south across much of the UK, increasing risk of wintry showers, perhaps snow to the higher ground in the north. Temperatures are likely to be below average.

Beyond the first week or so of March confidence in the weather pattern becomes very low, but a preference for blocked broad scale conditions remains which continues to increase potential for colder conditions compared to average.

Spells of rain become more likely, with a chance that some areas could see snow. Some wintry episodes could be disruptive with a combination of snow and strong winds. North-west areas of the UK have the highest chance of remaining drier than average.

Temperatures are most likely to be below average overall during at least the first half of March. But values are expected to be nearer average overall later on. Within this, shorter colder spells remain possible.

Keep up to date with the latest forecast on our website, by following us on Twitter and Facebook, as well as on our mobile app which is available for iPhone from the App store and for Android from the Google Play store. Keep track of current weather warnings on the weather warning page.

Date Created
February 2023